

Puget Sound Intertidal Biodiversity: Scales of Variability for Invertebrate and Algal Communities on Gravel Beaches

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Extended Abstract

This project continued our study of spatial and temporal variability of shoreline biota in the South and Central Puget Sound Basins Schoch and Dethier 1997; 1999). Sampling done in summer 2000 focused on quantifying interannual variation among biota, and testing the stability of the north-south negative trend in species diversity seen in the more extensive 1999 sampling (Dethier and Schoch, 2000). Preliminary data from our 1999 intertidal surveys of pebble beaches suggested that wave energy gradients along the axis of Puget Sound affect community structure by forcing the removal of fine sediments. In June 2000, we resampled 21 pebble beaches from the original 45 sampled in 1999, to compare data among years. We retained the nested sampling design in order to compare within and among different spatial scales. In each of 7 areas, the biota from three replicate beaches were sampled in the low zone along a 50-m horizontal transect. The 7 areas consisted of three bays in the southern basin of Puget Sound, and four circulation cells in the central basin. Replicate beaches were selected based on similarity of the geomorphic form, sediment size, slope angle, aspect, wave energy, surface roughness, and pore water chemistry. Data on mean annual water temperature, salinity, air temperature, precipitation, and wind speed and direction were also used to compare basin scale differences. Biota were sampled using standard quadrat and core techniques. All macroscopic algae and invertebrates were identified and abundances were estimated.

In 2000, we found a total of 123 taxa in 210 quadrats and cores (21 sites), as opposed to 150 taxa in 1999 from those same sites (we found a total of 230 taxa from all 48 sites sampled in 1999). Of the 178 combined taxa found in both years, 110 taxa were observed in both years, while 15 were found only in 2000, and 44 were found only in 1999. Species richness generally decreased from north to south, with a greater decrease observed in quadrat samples compared to core samples. Annelids, molluscs, arthropods, and rhodophytes represented 85% of the observed taxa. Non-metric ordinations were used to compare community structure among all samples collected in 1999 and 2000. We found that an along-axis trend in community structure was present in both years. There is correlative evidence suggesting that higher wave energy decreases the amount of small sediments in the northern beaches. Our data show a high degree of similarity among the communities from replicate beaches within a bay (south basin) or a circulation cell (central basin). This similarity could be due to larval retention within these areas, and/or a higher degree of physical similarity among beaches that are close together. There was a significant change in the communities between the 1999 and 2000 samples. There was a greater difference between years in the central basin than in the southern basin, but no clear explanation for this pattern. There is some evidence suggesting that an increased number of amphipods were sampled in 2000 in the Central Basin. Differences among communities are much greater spatially than temporally. The observed spatial differences were highly correlated to measured physical properties of the beaches whereas the observed temporal shifts have no clear explanation from the current dataset. A full report is being published by the Washington Department of Natural Resources and will be made available to the public (Schoch and Dethier In review).

Acknowledgements

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References

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